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**CLAIMS**

1       1. A method of making a low-loss electromagnetic wave resonator structure  
2 comprising:

3       providing a resonator structure, said resonator structure including a confining device  
4 and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
5 resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
6 field radiation pattern away from said confining device, said surrounding medium supporting at  
7 least one radiation channel into which said resonant mode can couple; and

8       specifically configuring said resonator structure to reduce or eliminate radiation loss  
9 from said resonant mode into at least one of said radiation channels, while keeping the  
10 characteristics of the near-field pattern substantially unchanged.

1       2. The method of claim 1, wherein said step of configuring comprises a modification  
2 of said far-field pattern.

1       3. The method of claim 1, wherein said step of configuring comprises a modification  
2 of the geometry or refractive index of said confining device.

1       4. The method of claim 3, wherein said modification has at least one plane of  
2 symmetry.

1       5. The method of claim 3, wherein said modification has no plane of symmetry.

1       6. The method of claim 1, wherein said step of configuring comprises an introduction  
2 of at least one nodal plane into said far-field pattern.

1       7. The method of claim 1, wherein said confining device operates using index  
2 confinement effects, photonic crystal band gap effects, or a combination of both.

1       8. The method of claim 1, wherein said surrounding medium is homogeneous.

1       9. The method of claim 1, wherein said surrounding medium is inhomogeneous.

1       10. The method of claim 1, wherein said radiation channels comprise superpositions of  
2 at least one spherical wave.

1       11. The method of claim 1, wherein said radiation channels comprise superpositions of  
2 at least one cylindrical wave.

1       12. The method of claim 1, wherein said confining device comprises a waveguide with  
2 a grating where said grating contains at least one defect.

1       13. The method of claim 12, wherein said step of configuring comprises modifying the  
2 dielectric constant of the grating.

1       14. The method of claim 12, wherein said step of configuring comprises modification  
2 of the local phase shift.

1       15. The method of claim 1, wherein said confining device comprises a waveguide  
2 microcavity.

1       16. The method of claim 1, wherein said confining device comprises a photonic crystal  
2 slab.

1       17. The method of claim 1, wherein said confining device comprises a disk resonator.

1       18. The method of claim 1, wherein said confining device comprises a ring resonator.

1       19. A method of making a low-loss electromagnetic wave resonator structure

2       comprising:

3           providing a resonator structure, said resonator structure including a confining device  
4       and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
5       resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
6       field radiation pattern away from said confining device, said surrounding medium supporting at  
7       least one radiation channel into which said resonant mode can couple; and

8           specifically configuring said resonator structure to increase radiation loss from said  
9       resonant mode into at least one of said radiation channels, while keeping the characteristics of  
10      the near-field pattern substantially unchanged.

1       20. The method of claim 19, wherein said radiation channel comprises of one or more  
2       spatial directions.

1       21. A method of making a low-loss acoustic wave resonator structure comprising:

2           providing a resonator structure, said resonator structure including a confining device  
3       and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4       resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5       field radiation pattern away from said confining device, said surrounding medium supporting at  
6       least one radiation channel into which said resonant mode can couple; and

7 specifically configuring said resonator structure to reduce or eliminate radiation loss  
8 from said resonant mode into at least one of said radiation channels, while keeping the  
9 characteristics of the near-field pattern substantially unchanged.

1 22. A method of designing a low-loss electronic wave resonator structure comprising:  
2 providing a resonator structure, said resonator structure including a confining device  
3 and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4 resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5 field radiation pattern away from said confining device, said surrounding medium supporting at  
6 least one radiation channel into which said resonant mode can couple; and  
7 specifically configuring said resonator structure to reduce or eliminate radiation loss  
8 from said resonant mode into at least one of said radiation channels, while keeping the  
9 characteristics of the near-field pattern substantially unchanged.

1 23. A method of making a low-loss acoustic wave resonator structure comprising:  
2 providing a resonator structure, said resonator structure including a confining device  
3 and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4 resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5 field radiation pattern away from said confining device, said surrounding medium supporting at  
6 least one radiation channel into which said resonant mode can couple; and  
7 specifically configuring said resonator structure to increase radiation loss from said  
8 resonant mode into at least one of said radiation channels, while keeping the characteristics of  
9 the near-field pattern substantially unchanged.

1           24. The method of claim 23, wherein said radiation channel comprises of one or  
2        more spatial directions.

1           25. A method of making a low-loss electronic wave resonator structure comprising:  
2           providing a resonator structure, said resonator structure including a confining device  
3           and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4           resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5           field radiation pattern away from said confining device, said surrounding medium supporting at  
6           least one radiation channel into which said resonant mode can couple; and  
7           specifically configuring said resonator structure to increase radiation loss from said  
8           resonant mode into at least one of said radiation channels, while keeping the characteristics of  
9           the near-field pattern substantially unchanged.

1           26. The method of claim 25, wherein said radiation channel comprises of one or more  
2        spatial directions.